

# Surgical Management of Charcot without Internal Fixation

## Purpose

Often in the literature, Charcot reconstruction consists of internal fixation with or without the assistance of external fixation. Yet, few reports demonstrate these corrective procedures using external fixation alone. This case series presents our technique and protocol for exclusively using external fixation for correction of Charcot midfoot deformities.

## Literature Review:

External fixation provides excellent stability for various osseous and soft tissue deformities and allows for excellent compression as well as enforced compliance in non weight bearing status. Paola et al<sup>(1)</sup> studied 45 patients who underwent reconstruction of unstable Charcot arthropathy using an external fixator device. Thirty-nine patients (87%) went on to heal at 25.7 weeks. Only two patients underwent further revision procedures using intramedullary nails whereas four patients developed an infection and opted for an amputation. Furthermore, in a prospective study by Elalfy et al<sup>(2)</sup>, 24 patients with diabetic neuro arthropathy of the ankle were treated with intramedullary nails and Ilizarov external fixator. No patient from this group required future amputation and all were pain-free. Their average AOFAS score reached  $66.4 \pm 4.5$  from  $34.6 \pm 6.8$  at the last follow-up visit<sup>(2)</sup>. Pinzur et al<sup>(3)</sup> revealed excellent result at 1-year follow-up visit in 58 of 73 patients who underwent surgical correction for Charcot arthropathy. Subjects in this group were free of infection during the follow-up period as well, however, 3 patients required future amputation due to bony instability. Richman et al<sup>(4)</sup> concluded that the rate of revisional surgery in the Intramedullary group was slightly higher than the external ring fixator group, however both modalities lead to superb limb salvage.

## Methodology

Five patients included in this case series each presented with a chronic diabetic neuropathic wound secondary to Charcot midfoot deformity. Each was treated with stabilization and offloading via external fixation. Average follow up time was 14 months (range 10-18 months). Primary outcomes measured were reduction of deformity, wound healing, and stable, plantigrade foot.

## Procedure:

All patients initially underwent wound debridement of ulceration. Surgical technique consisted of a tendo-Achilles lengthening allow for equinus reduction. Two tibial half pins inserted in the anterior midshaft with secured crossbar. Two converging half pins were then inserted into the posterior calcaneus with U-bar attached. This allowed for easier reduction in all three planes compared to a transcalcaneal pin. This configuration also offloaded the rearfoot. Two bars then connected the U-bar and crossbar in delta fashion. A half pin was inserted through the bases of the 1<sup>st</sup> and 2<sup>nd</sup> metatarsals medially and another one was inserted laterally into the bases of all lesser metatarsals. Bars were used to connect metatarsal pins to the delta frame. The foot was reduced out of equinus and place in neutral rearfoot position as clamps were tightened. The forefoot was then plantarflexed, adducted, everted, and clamped to reduce midfoot deformity. All clamps were securely tightened and patients were instructed to remain non-weight bearing.



## Results:

All patients remained in external fixation until osseous fusion and complete healing of ulceration (average of 10 weeks). Serial plain films revealed union of midfoot fragmentation with no evidence of osteomyelitis to date. A plantigrade braceable foot was maintained for all patients with no secondary complications noted.

## Discussion

Our study indicates that the use of external fixation can achieve stable reduction of Charcot deformities. External fixation is beneficial in patients with poor bone quality and multiple comorbidities along with avoiding complications larger incisions involved in internal hardware. There is also the added benefit of using external fixation in the presence of ulceration and infection. Short et al<sup>(5)</sup> noted that external fixation is indicated in poor bone quality and osteoporosis and can achieve osseous correction with exostectomy, osteotomy, and/or arthrodesis. There is also the ability to increase compression with adjustments of pins. Burns et al<sup>(6)</sup> showed that external fixation extended beyond the zone of injury as part of the superconstruct. Soft tissues structures were protected and minimized skin tension. Lee et al<sup>(7)</sup> concluded that internal fixation is more likely to achieve osseous union more consistently, but with higher complications including higher probability of amputation. Included was 1.5 times more likely to result in amputation excluding toe amputations, two times more likely to result in deep infection, and 3.4 more likely to develop wound complications. In conclusion, external fixation allows for stable reduction of Charcot deformities while maintaining compliance of patient's non-weight bearing status. Sole use of external fixation negates the complications associated with internal fixation. For management of Charcot deformities, isolated external fixation is an excellent tool in the surgeon's armamentarium.

## References:

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